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ABSTRACT

Science and technology (S&T) data are presented in 36 charts, graphs, or tables. These data are organized into three major categories, namely, research and development (R&D) funding, human resources, and international S&T indicators. R&D funding is subdivided into national, federal, industry, and academic categories, with data reflecting, when applicable, funding, obligations, and/or expenditures by source, performer, and character of work. Human resources is subdivided into categories of utilization (with data on employed scientists and engineers by field, sector, primary work activity, highest degree and field, data on women and racial minorities, and retention rates from fifth grade through receipt of doctorate, 1965-1984) and supply (with data on bachelor's, master's and doctoral degrees awarded in science and engineering (S/E) fields, full-time S/E graduate students in doctorate-granting institutions by source of major support, and other data). International S&T indicators includes data on scientists and engineers engaged in R&D per 10,000 labor force by country, R&D/gross national produce (GNP) ratios by country, nondefense R&D/GNP by country, U.S. patents granted to U.S. and foreign inventors by year of application, U.S. scientific and technical publications (S/T) as a percent of all S/T publications (1982), and other data. (JN)

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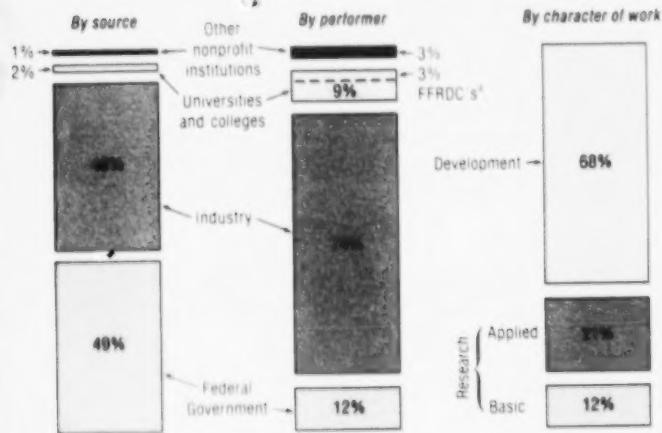
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R&D FUNDING

Figure 1

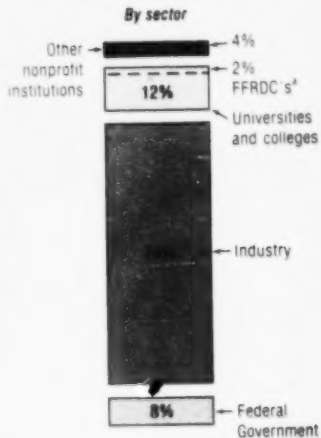
The national R&D effort

Expenditures for research and development = \$122.0 billion, 1986 (est.)



Employed R&D scientists/engineers

= 765,000,[†] 1985 (est.)



*Federal funded research and development centers administered by universities and colleges

[†] Full time equivalents

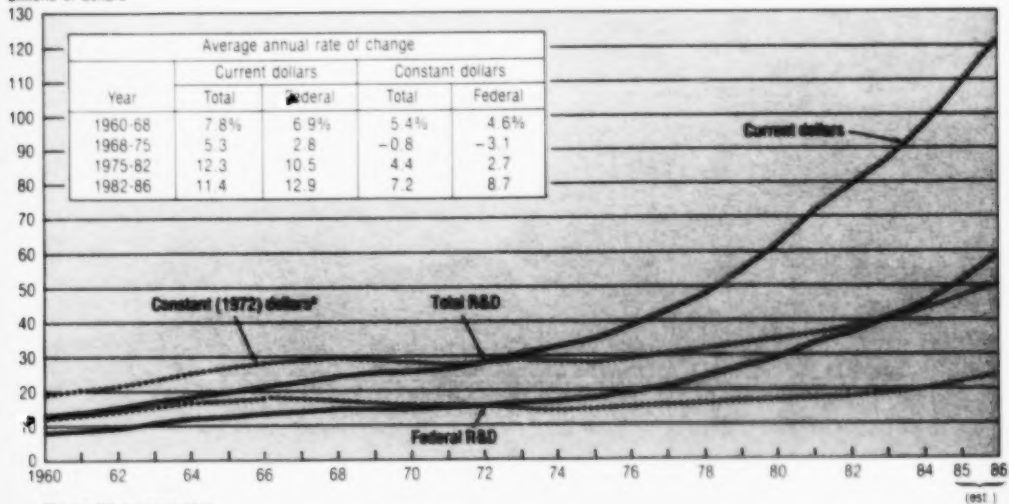
SOURCE: National Science Foundation

Additional data may be obtained from: John B. Choecheo, SRS, Phone: (202) 634-4625

Figure 2

National R&D funding by source

Billions of dollars



*Based on GNP implicit price deflator

SOURCE: National Science Foundation

Additional data may be obtained from: John R. Chirico, SRS, Phone: (202) 634-4625

Figure 3

National R&D funding by performer

[Dollars in millions]

Year	Current Dollars					Constant (1972) dollars ^a				
	Total	Federal Government	Industry	Universities / colleges	Other performers	Total	Federal Government	Industry	Universities / colleges	Other performers
1960	\$ 13,523	\$ 1,726	\$10,500	\$ 646	\$ 642	\$ 19,634	\$ 2,481	\$15,257	\$ 929	\$ 927
1968	24,605	3,494	17,429	2,149	1,533	29,831	4,245	21,116	2,611	1,890
1975	35,213	5,354	24,167	3,409	2,283	38,153	4,344	19,329	2,768	1,814
1982	79,326	9,141	57,995	7,288	4,904	38,188	4,367	27,886	3,482	2,353
1985	109,250	13,150	80,000	9,500	6,600	47,000	5,889	34,500	4,180	2,890
(est.)										
1986	122,000	14,500	90,000	10,600	6,900	50,400	5,950	37,300	4,350	2,890
(est.)										

Year	Average annual rate of change									
	Current Dollars					Constant (1972) dollars ^a				
	Total	Federal Government	Industry	Universities / colleges	Other performers	Total	Federal Government	Industry	Universities / colleges	Other performers
1960-68	7.8%	9.2%	6.5%	16.2%	11.9%	5.8%	6.9%	4.1%	13.8%	8.1%
1969-75	5.3	6.3	4.8	6.8	3.7	-0.8	0.3	-1.3	0.8	-0.4
1975-82	12.3	7.9	13.3	11.5	11.7	4.4	0.1	5.5	3.3	3.8
1982-86	11.4	12.2	11.6	9.8	6.9	7.2	6.0	7.5	5.7	4.6

^aBased on GNP implicit price deflator

SOURCE: National Science Foundation

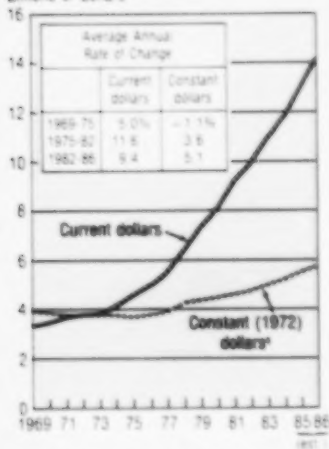
Additional data may be obtained from: John R. Donchick, SRS, Phone: (202) 634-4625

Figure 4

National R&D spending by character of work

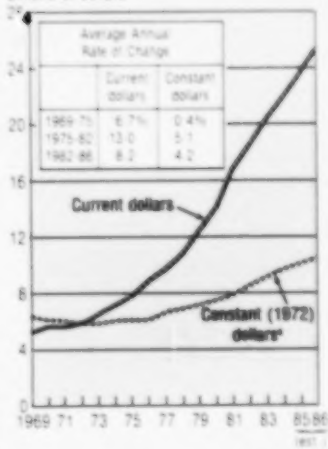
Basic research

Billions of dollars



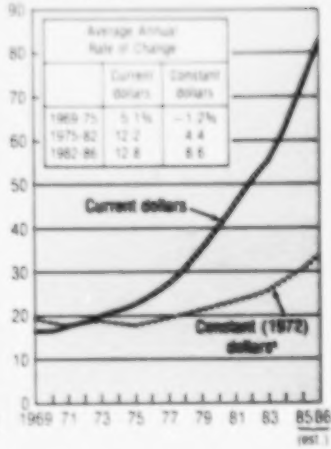
Applied research

Billions of dollars



Development

Billions of dollars



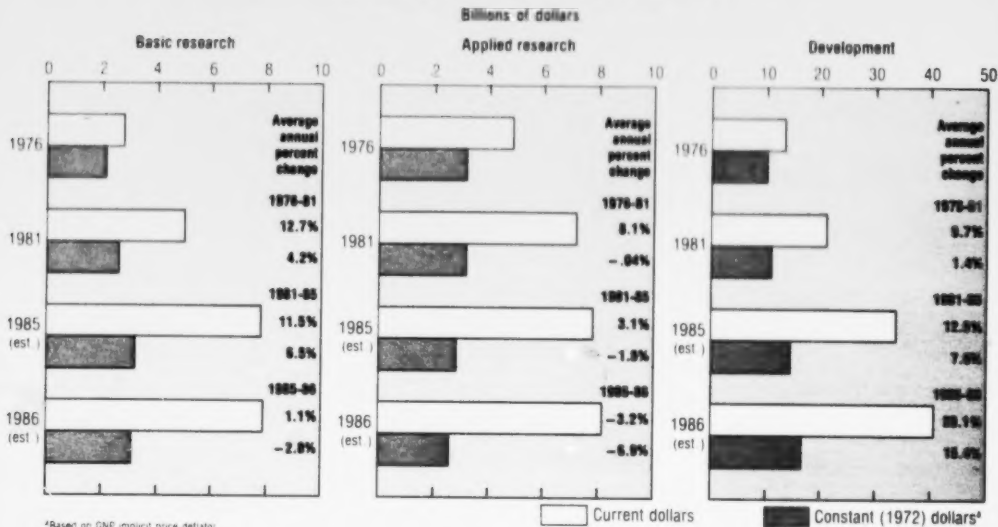
*Based on GNP implicit price deflator

SOURCE: National Science Foundation

Additional data may be obtained from John R. Chouhrouh, GRS, Phone (202) 634-4621

Figure 5

Federal R&D obligations by character of work



*Based on GNP implicit price deflator

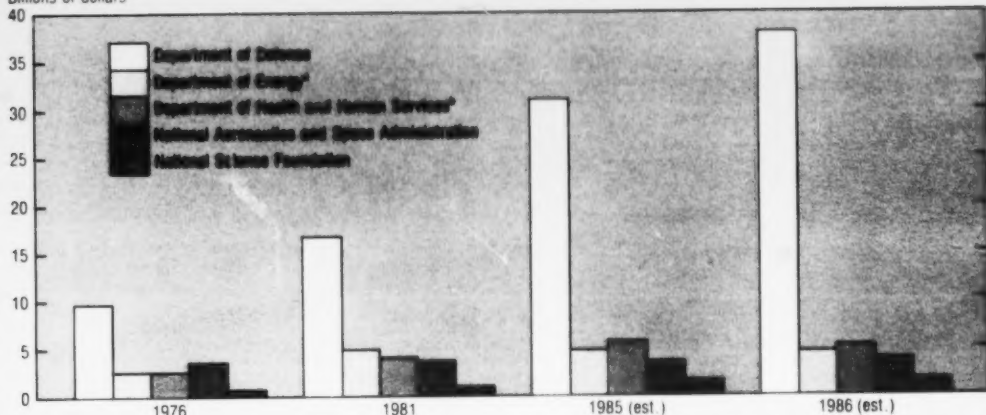
SOURCE: National Science Foundation

Additional data may be obtained from: Gerard R. Glaser, Jr. SRS Phone: (202) 634-4636

Figure 6

Federal R&D obligations by agency

Billions of dollars



Average annual percentage change

11.2% 14.8% 5.8% 5.8% 9.8%
1976-81

17.9% -2.4% 5.8% -2.1% 5.8%
1981-85

22.5% -2.3% -2.7% 12.3% 5.8%
1985-86

*ERDA in 1976

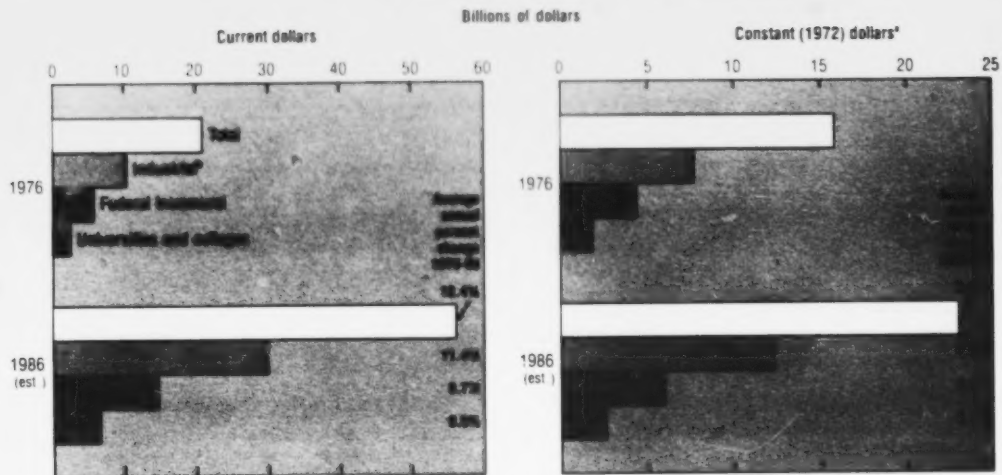
*HEW in 1976 adjusted to reflect only health and human services programs (without education)

SOURCE: National Science Foundation

Additional data may be obtained from: Gerard R. Glaser, Jr., SRS, Phone: (202) 634-4636

Figure 7

Federal R&D obligations by major performer



*Based on GNP implicit price deflator

^bIncludes federally funded research and development centers

SOURCE: National Science Foundation

Additional data may be obtained from: Gerard R. Glaser, Jr., SRS, Phone: (707) 634-4636

Figure 8

Federal obligations for basic research by major field of science / engineering

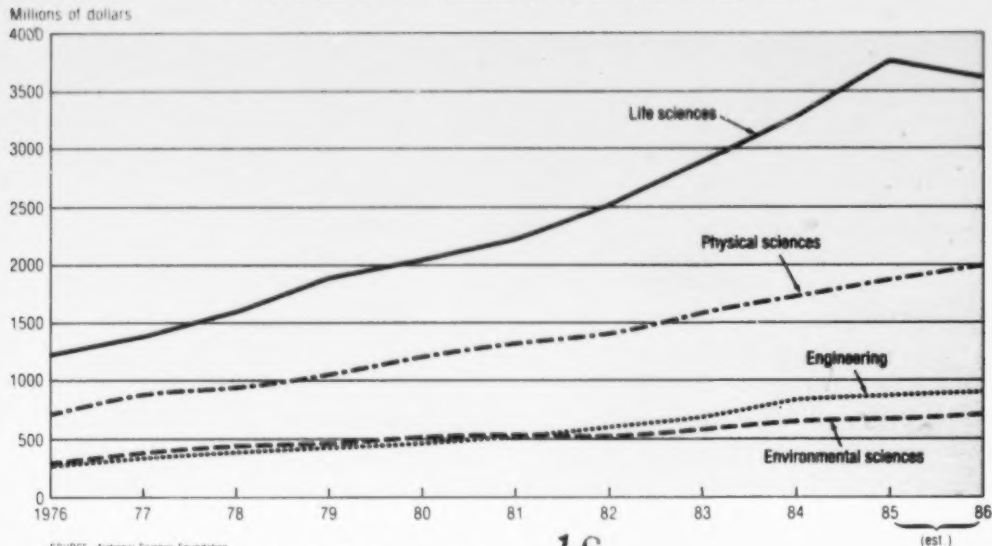
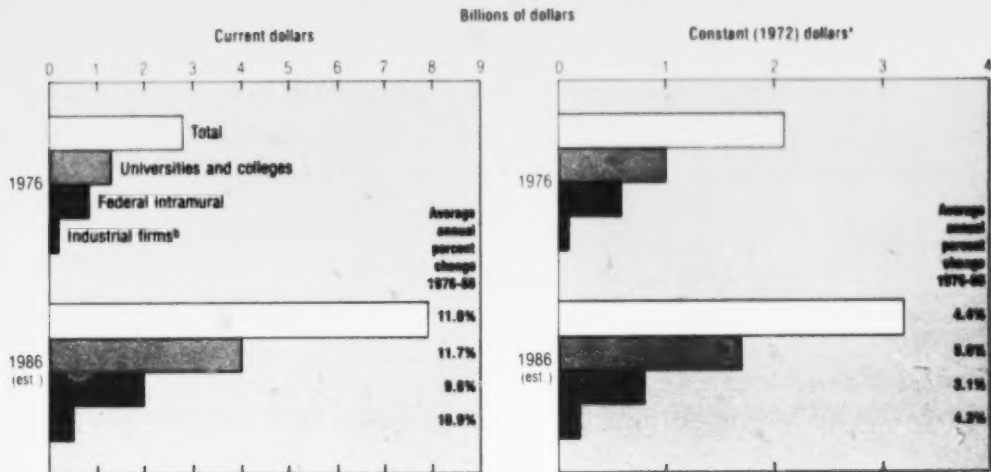


Figure 9

Federal obligations for basic research by major performer



*Based on GNP implicit price deflator

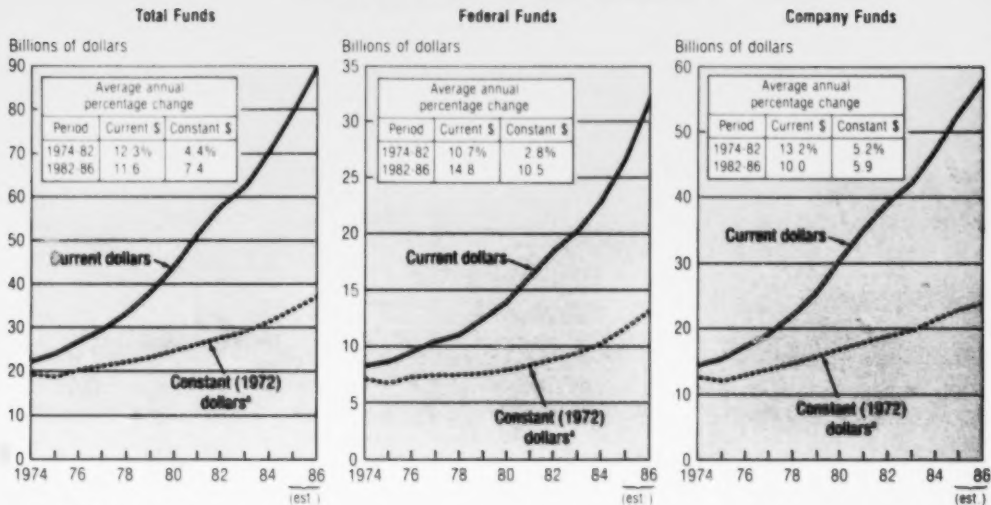
^bIncludes federally funded research and development centers

SOURCE: National Science Foundation

Additional data may be obtained from: Gerard R. Glaser, Jr., SRS Phone: (202) 634-4636

Figure 10

Industrial R&D expenditures by source of funds



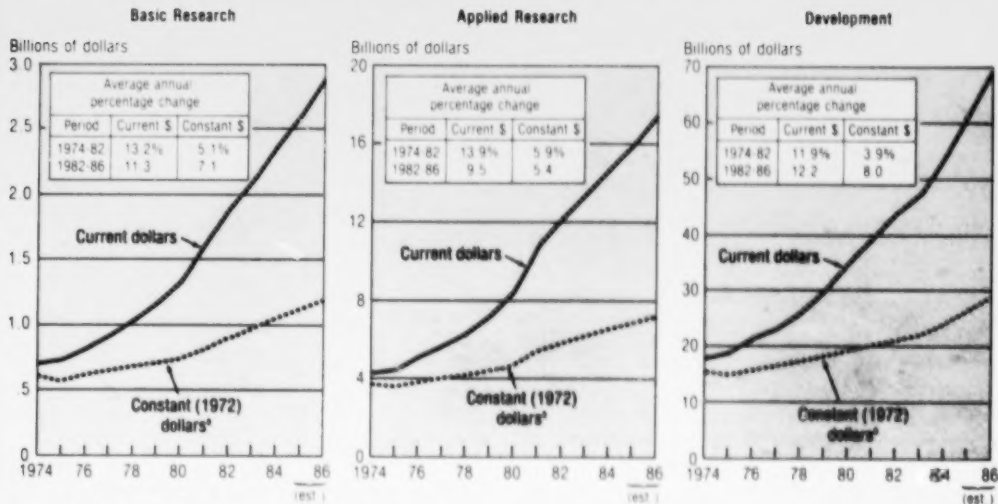
*Based on UNP implicit price deflator

SOURCE: National Science Foundation

Additional data may be obtained from: Thomas J. Hogan, SRS, Phone: (202) 634-4648

Figure 11

Industrial R&D expenditures by character of work



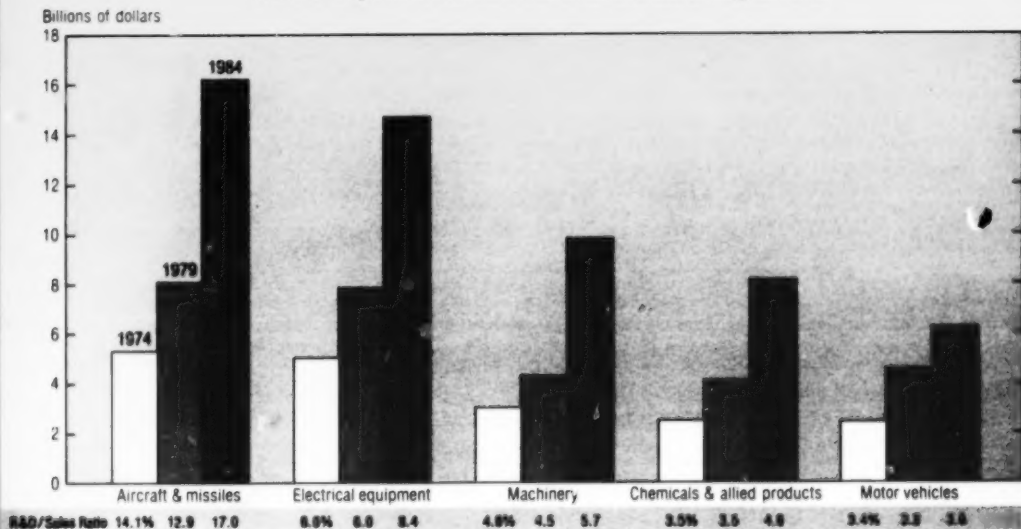
*Based on GNP implicit price deflator

SOURCE: National Science Foundation

Additional data may be obtained from: Thomas J. Hogan, SRS, Phone: (202) 634-4648

Figure 12

Total R&D expenditures and R&D/Sales Ratio of five leading industries



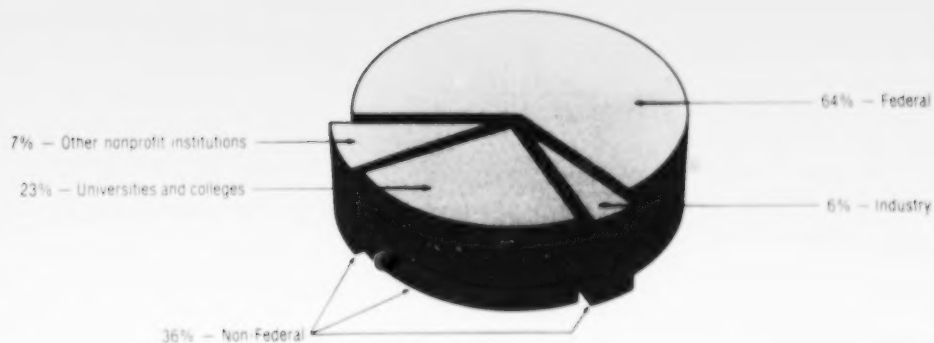
SOURCE: National Science Foundation

Additional data may be obtained from Thomas J. Hogan, SRS, Phone (202) 634-4648

Figure 13

Academic R&D expenditures by source: FY 1986

Total: \$10.6 billion



NOTE: The Federal portion of academic R&D has ranged between 62 percent and 66 percent during the 1970-85 period.

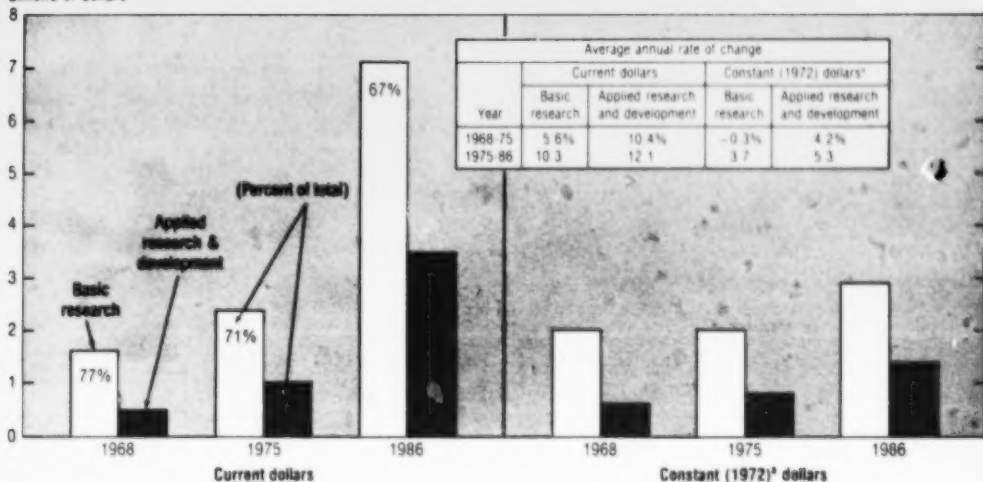
SOURCE: NSF Science Foundation.

Additional data may be obtained from: John R. Churchill, SRS, Phone: (202) 634-4625.

Figure 14

Academic R&D expenditures by character of work

Billions of dollars



*Based on GNP implicit price deflator

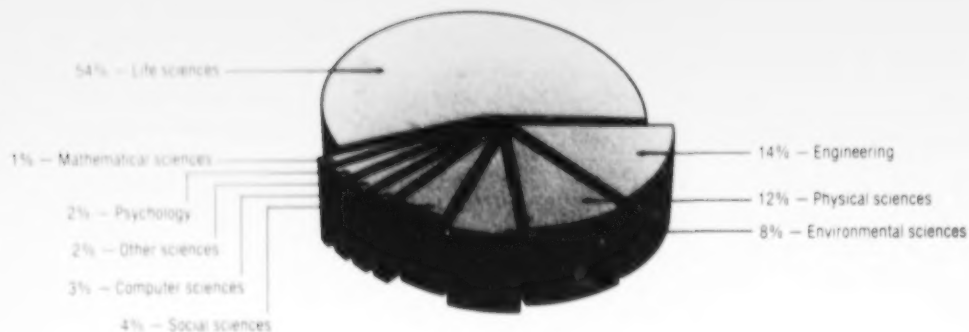
SOURCE: National Science Foundation

Additional data may be obtained from: John R. Churchill, SRS, Phone: (202) 634-4625

Figure 15

Academic R&D expenditures by field: FY 1984

Total \$8.5 billion



NOTE: The distribution of academic R&D expenditures in FY 1988 was essentially the same as in FY 1984.

SOURCE: National Science Foundation.

Additional data may be obtained from: Penny G. Foster, SRS, Phone: (202) 634-4629.

Figure 16

Federal obligations to universities and colleges by type of activity¹

(Dollars in millions)

Fiscal year ²	Total obligations	Academic science/engineering					
		Total	Research and development ³	R&D plant	Fellowships, traineeships, and training grants	All other	Non-science/engineering
1963	\$1,413	\$1,329	\$830	\$106	*	\$393	\$85
1967	3,318	2,324	1,301	111	447	464	994
1975	4,547	2,806	2,246	45	201	314	1,741
1980	8,298	4,803	4,160	38	223	383	3,495
1984	10,100	6,441	5,623	50	258	510	3,659
Average annual rates of change (Current dollars)							
1963-67	23.8%	15.0%	11.0%	1.3%	N/A	4.2%	85.2%
1967-75	4.0	2.4	7.1	-10.8	-9.5	-4.8	7.3
1975-80	12.8	11.4	13.1	-3.3	2.1	4.1	14.9
1980-84	5.0	7.6	7.8	7.1	3.8	7.4	1.2
(Constant dollars)							
1963-67	21.0%	12.4%	9.4%	-1.0%	N/A	1.9%	81.0%
1967-75	-1.5	-3.1	1.3	-15.5	-14.3	-9.9	1.5
1975-80	4.8	3.5	5.1	-10.2	-5.1	-3.3	6.8
1980-84	-1.1	1.3	1.5	0.9	-2.3	1.2	-4.7

¹Detail may not add to total because of rounding²Academic research and development is estimated at \$6.4 billion for both 1985 and 1986. Separate data for the other components of academic science/engineering and non-science/engineering are not available.³Total obligations for the years 1981 through 1983 have been estimated by NSF based on revised data on student aid provided by the Department of Education.⁴Separate data were unavailable for this component before 1966.

SOURCE: National Science Foundation

Additional data may be obtained from: Penny D. Foster, SRS, Phone: (202) 634-4629.

HUMAN RESOURCES

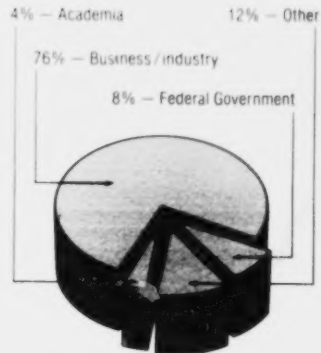
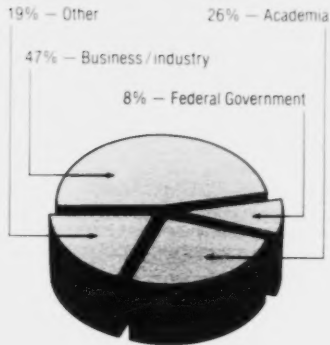
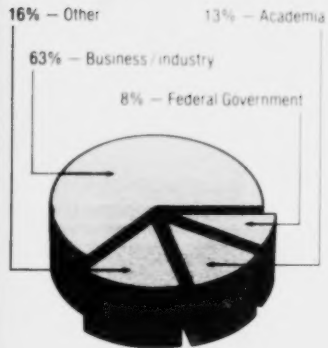
Figure 18

Employed scientists and engineers by sector: 1984

**Scientists/engineers,
total = 4.0 million**

Scientists = 1.8 million

Engineers = 2.2 million



SOURCE: National Science Foundation
Additional data may be obtained from: Michael F. Crowley, SRS, Phone: (202) 634-4664

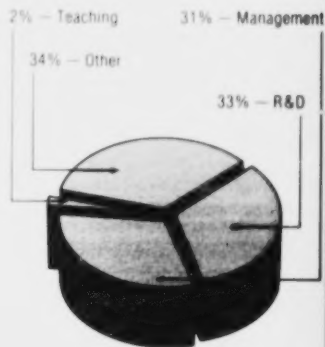
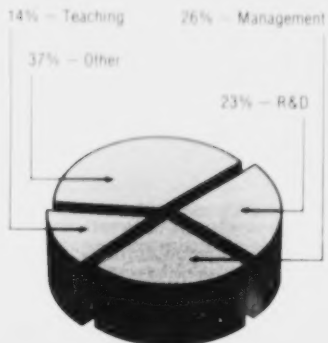
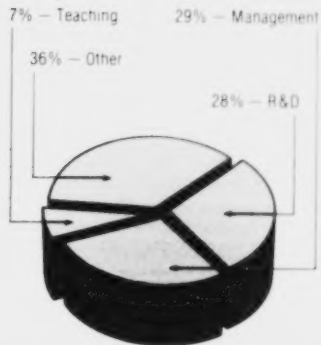
Figure 19

Employed scientists and engineers by primary work activity: 1984

Scientists/engineers
total = 4.0 million

Scientists = 1.8 million

Engineers = 2.2 million



SOURCE: National Science Foundation
Additional data may be obtained from: Michael F. Crowley, SRS, Phone (202) 634 4664

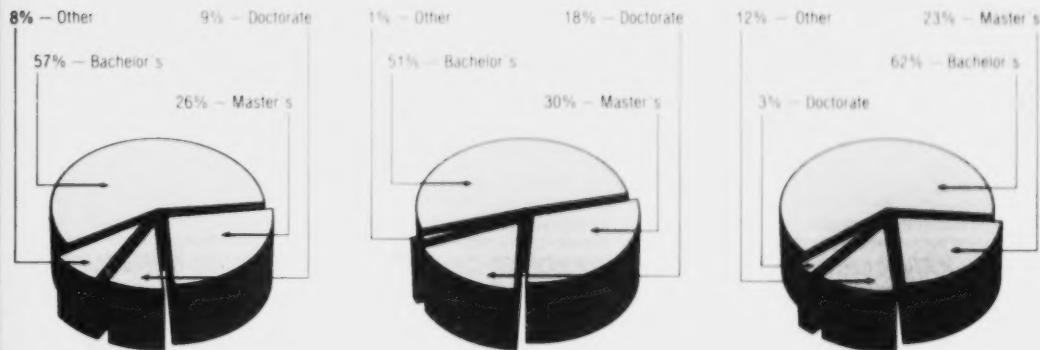
Figure 20

Employed scientists and engineers by highest degree: 1984

Scientists/engineers
total = 4.0 million

Scientists = 1.8 million

Engineers = 2.2 million



NOTE: Total may not add up to 100 because of rounding.

SOURCE: National Science Foundation.

Additional data may be obtained from: Michael F. Crowley, SRS, Phone: (202) 634-4664.

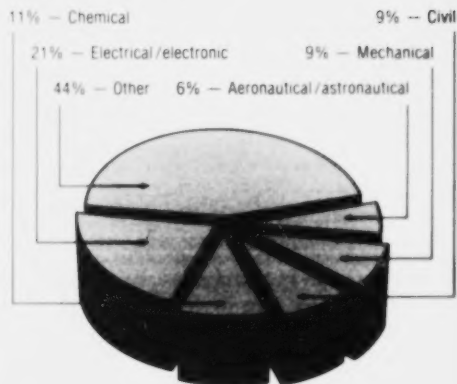
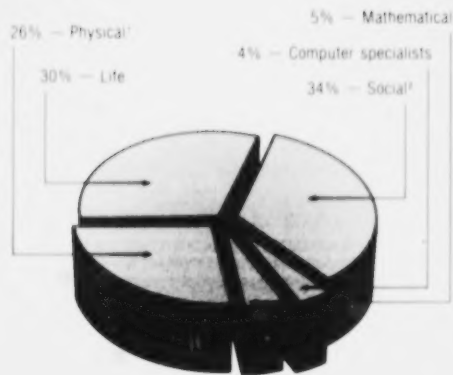
Figure 21

Employed doctorates in science and engineering by field: 1983

Scientists/engineers, total = 369,300

Scientists = 307,800

Engineers = 61,500



^aIncludes environmental scientists. 5 percent of total scientists

^bIncludes psychologists. 15 percent of total scientists

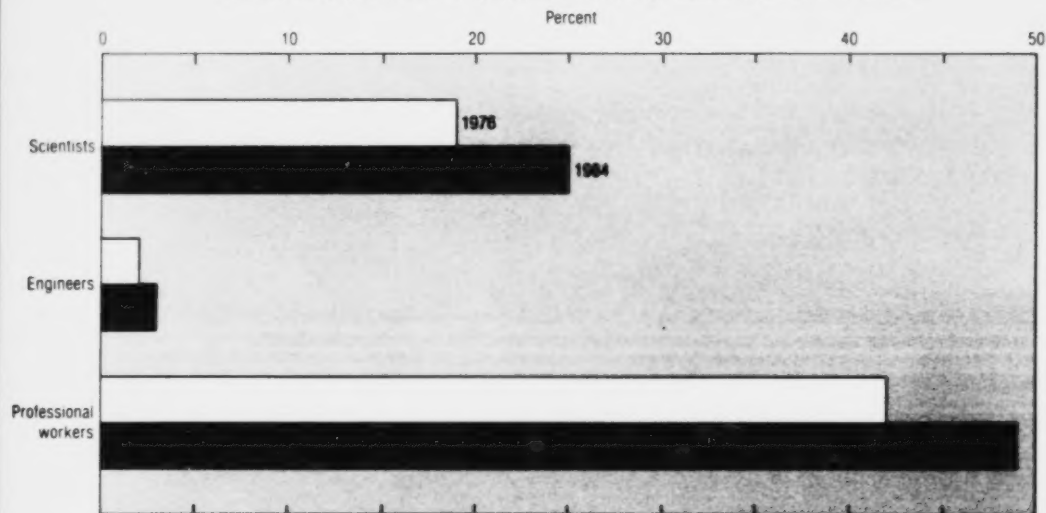
NOTE: Total may not add up to 100 because of rounding

SOURCE: National Science Foundation

Additional data may be obtained from: Michael F. Crowley, SRS, Ph.D., 202/634-4664

Figure 22

Women as a proportion of all employed scientists, engineers, and professional workers



SOURCES: National Science Foundation and Department of Labor
Additional data may be obtained from Michael F. Crowley, SRS, Phone: (202) 634 4664

Figure 23

Racial minorities as a percent of technical work force

Technical work force	1976		1984	
	Black	Asian	Black	Asian
	(Percent of total)	(Percent of total)	(Percent of total)	(Percent of total)
Professional workers	NA	NA	6	NA
Total scientists and engineers	2	5	2	5
Scientists	2	5	3	4
Engineers	1	4	2	5

NOTE: NA, not available.

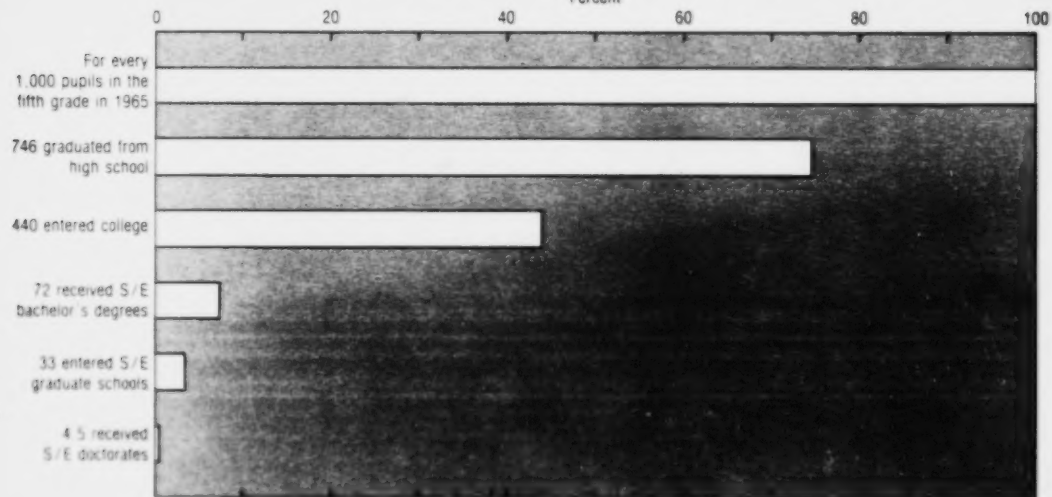
SOURCE: National Science Foundation.

Additional data may be obtained from: Michael P. Crowley, SRS, Phone: (202) 634-4664.

Figure 24

Retention rates, fifth grade through receipt of science/engineering doctorate: 1965-84

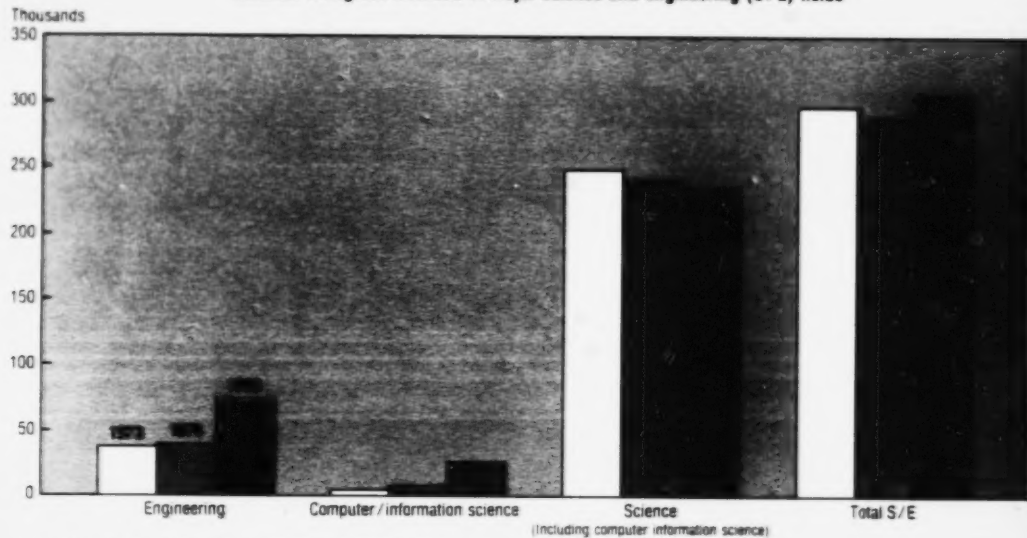
Percent



SOURCE: National Center for Education Statistics, National Academy of Sciences, and National Science Foundation.
Additional data may be obtained from: Mary A. Gellatly, SRS, Phone: (202) 634-4787.

Figure 25

Bachelor's degrees awarded in major science and engineering (S/E) fields

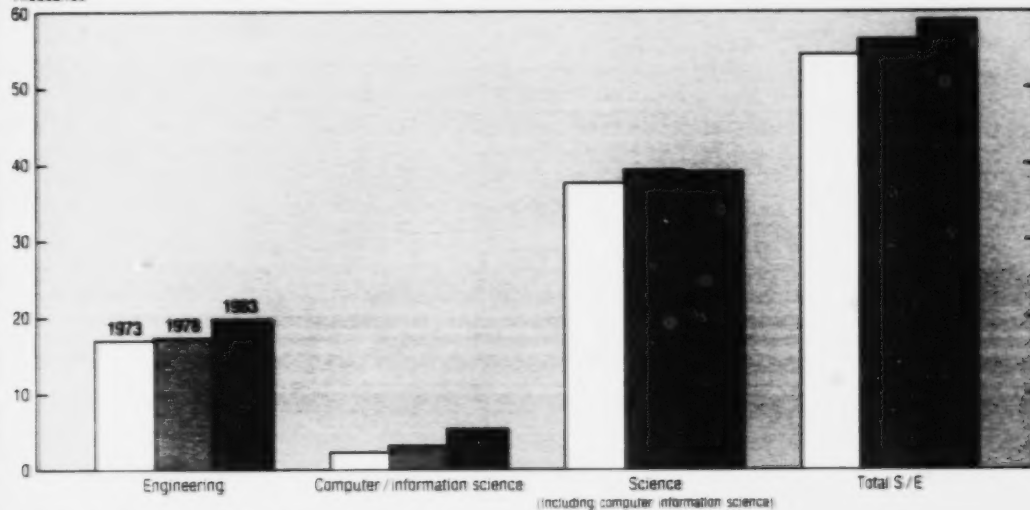


SOURCES: National Center for Education Statistics and National Science Foundation.
Additional data may be obtained from Mary A. Gohaday, SRS. Phone: (202) 634-4787.

Figure 26

Master's degrees awarded in major science and engineering (S/E) fields

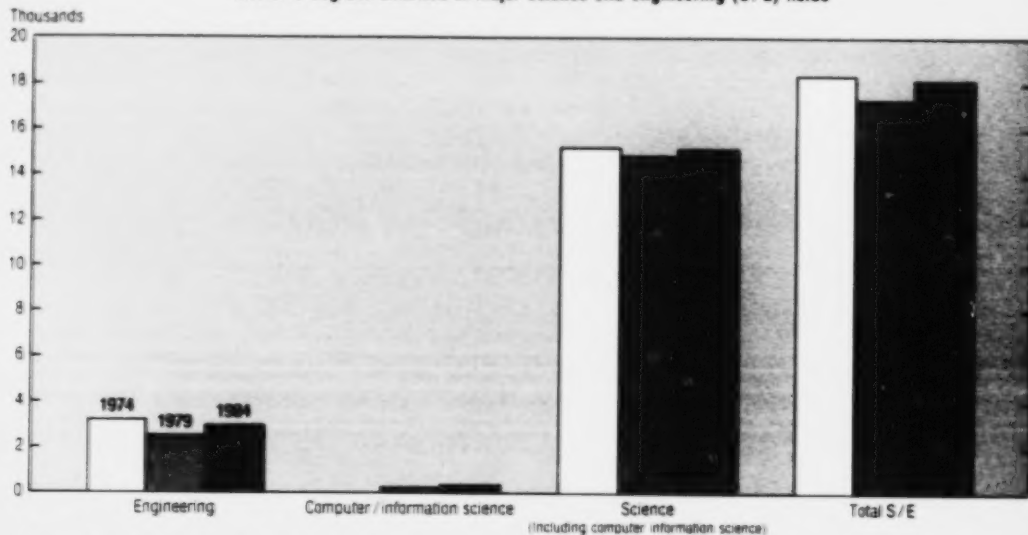
Thousands



SOURCES: National Center for Education Statistics and National Science Foundation
Additional data may be obtained from: Mary A. Gokstad; SRS; Phone: (202) 634-4787

Figure 27

Doctor's degrees awarded in major science and engineering (S/E) fields

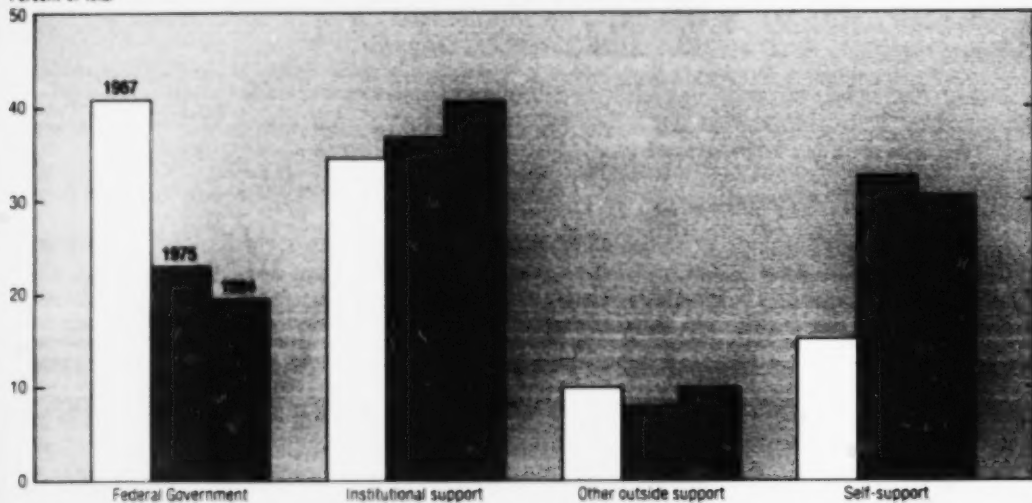


SOURCES: National Academy of Science and National Science Foundation.
Additional data may be obtained from: Mary A. Galadaye, SRS, Phone: (202) 434-4787.

Figure 28

**Full-time science/engineering graduate students
by source of major support**

Percent of total



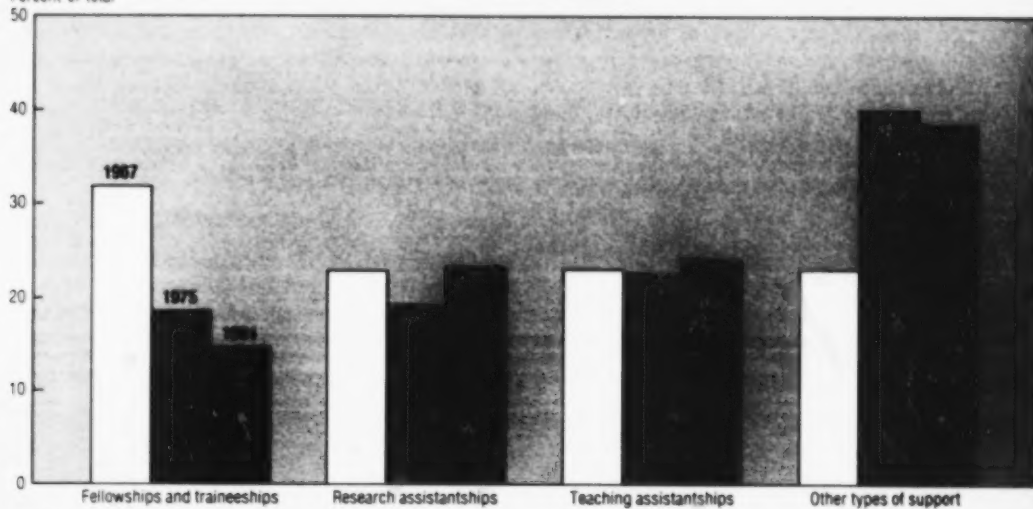
SDI/RCE National Science Foundation

Additional data may be obtained from: Penny J. Foster, SRS, Phone: (202) 634-4629

Figure 29

**Full-time science/engineering graduate students
by type of major support**

Percent of total



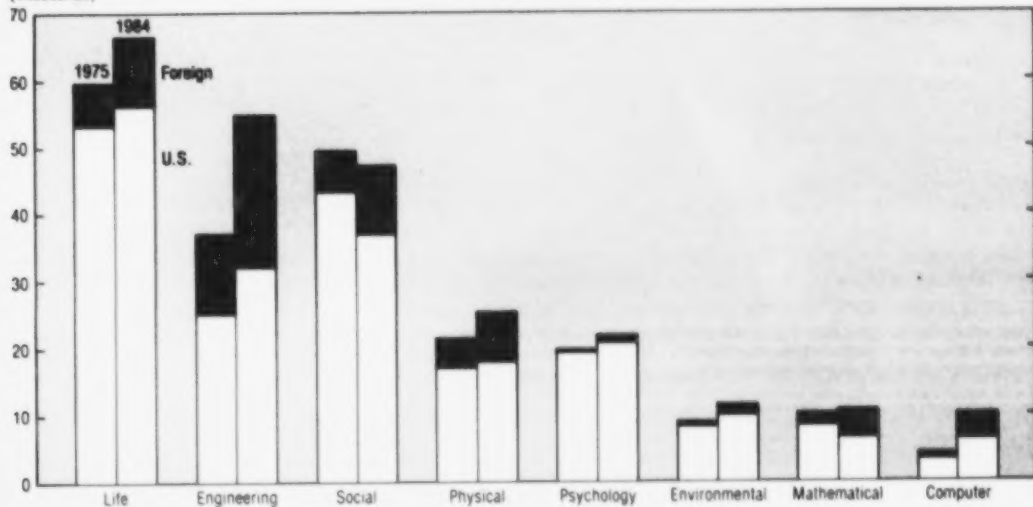
SOURCE: National Science Foundation

Additional data may be obtained from: Penny O. Foster SRS, Phone: (202) 634-4629

Figure 30

**Full-time science/engineering graduate students
by field and citizenship**

(Thousands)



SOURCE: National Science Foundation

Additional data may be obtained from: Penny D. Foster, SRS, Phone: (202) 634-4629

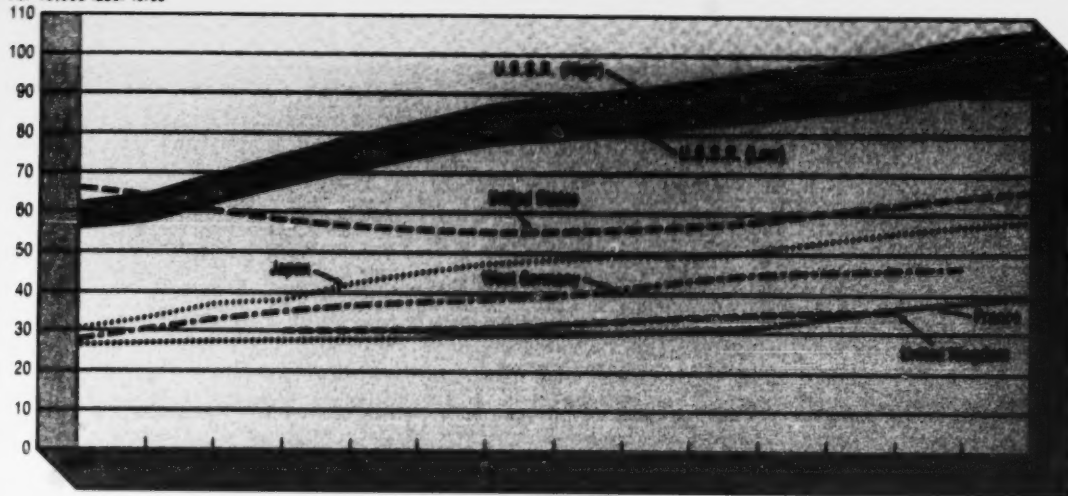
INTERNATIONAL S/T INDICATORS

40

Figure 31

Scientists and engineers engaged in R&D per 10,000 labor force by country

Per 10,000 labor force



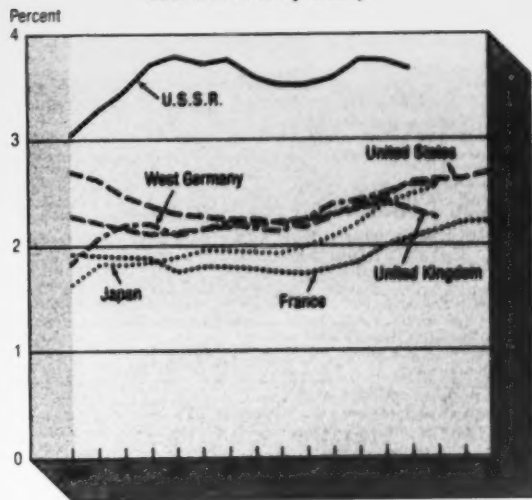
NOTE: A range has been provided for the U.S.S.R. because of the difficulties inherent in comparing Soviet scientific personnel data.

SOURCES: National Science Foundation, Organization for Economic Cooperation and Development, and Dr. Robert Campbell (Indiana University).

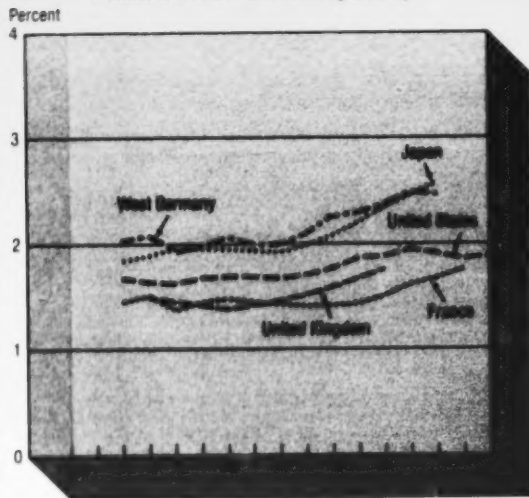
Additional data may be obtained from: Carlos Kruytboech, SRB, Phone (202) 634-4862.

Figure 32

R&D/GNP ratios by country



Nondefense R&D/GNP ratios by country¹



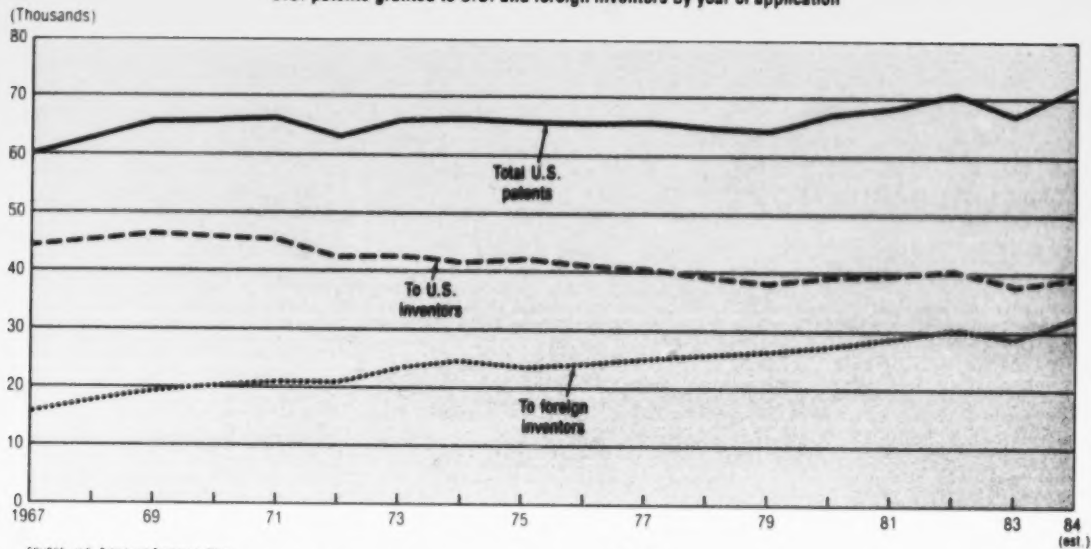
¹Separate data for nondefense R&D in the U.S.S.R. not available.

SOURCES: National Science Foundation and Organization for Economic Cooperation and Development.

Additional data may be obtained from: Carlos Kruytbosch, SRS, Phone (202) 634-4682.

Figure 33

U.S. patents granted to U.S. and foreign inventors by year of application

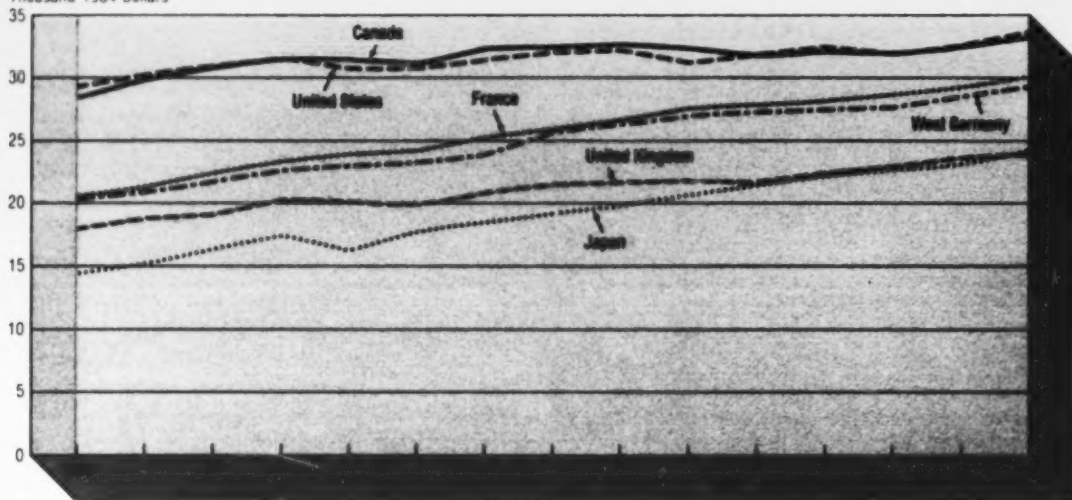


SOURCE: U.S. Patent and Trademark Office.
 Additional data may be obtained from: Carlos Kruytbosch, SRS Phone: (202) 634-4862

Figure 34

Gross domestic product per employed person, constant (1984) dollars

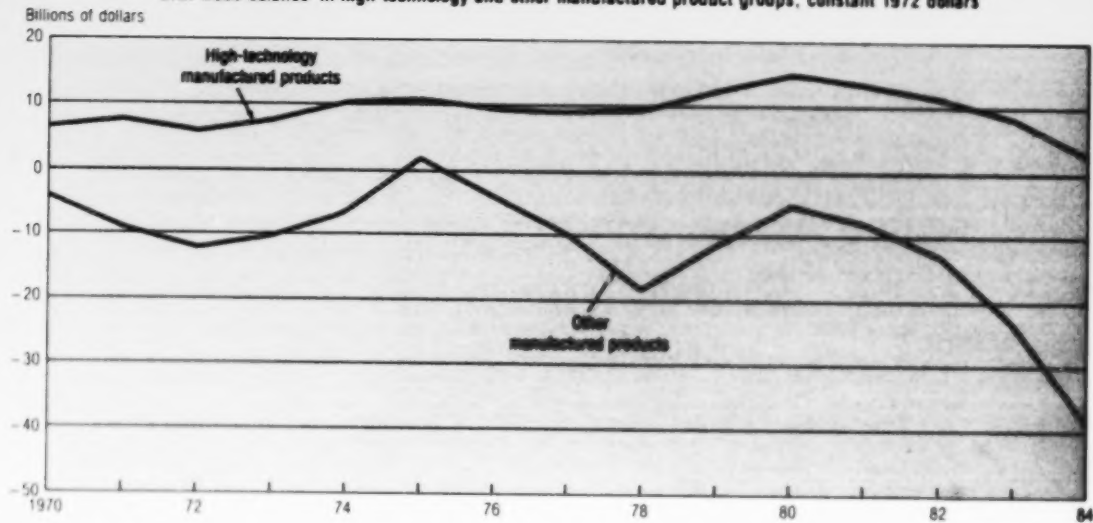
Thousand 1984 Dollars



SOURCE: Department of Labor, Bureau of Labor Statistics
Additional data may be obtained from: Carlos Kruttschnitt, SRS, Phone: (202) 634-4682

Figure 35

U.S. trade balance^a in high-technology and other manufactured product groups, constant 1972 dollars



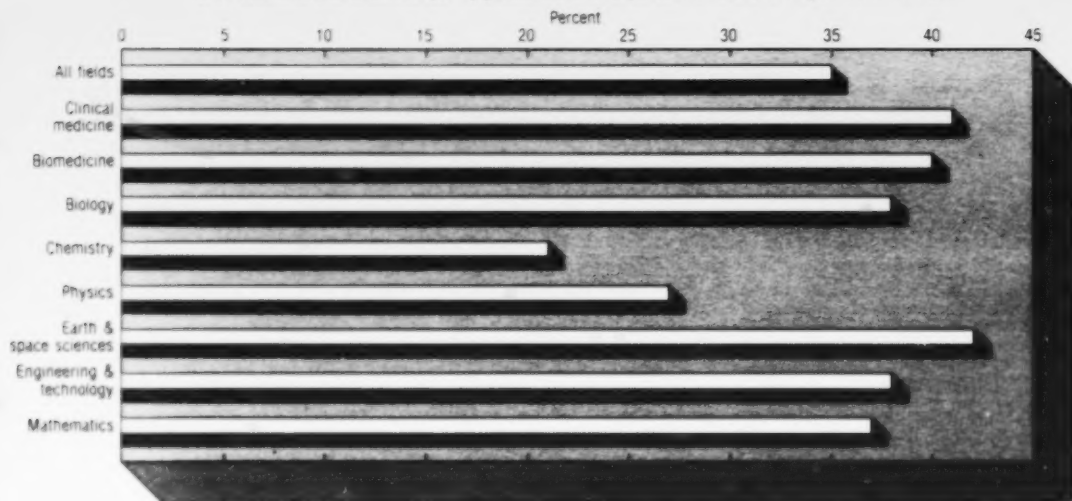
^aExports less imports.

SOURCE: Department of Commerce.

Additional data may be obtained from: Carlos Krzyziosch, SRS, Phone (202) 634-4682.

Figure 36

U.S. scientific and technical (S/T) publications as a percent of world S/T publications: 1982



NOTE: These data are based on the articles, notes, and reviews in over 2,100 influential journals carried in the 1981 Science Citation Index of the Institute for Scientific Information. An article written by researchers from more than one country is prorated across the countries involved.

SOURCE: Computer Horizons, Inc.

Additional data may be obtained from: Carlos Kruytboech, SRS, Phone: (202) 634-4682.

Other Science Resources Publications

R&D Funds

15% Increase in Federal R&D Funds Proposed in 1986 Budget, Mostly for Defense	NSF No. 85-322
Federal Emphasis on Defense is Major Factor in 1983 Increase in Industrial R&D Performance	85-318 (Rev.)
Universities Report Research Equipment Shortages Are Most Severe in the Physical Sciences and Engineering	85-320
Federal Academic R&D Funds Continue Strong Growth Through 1985	85-314
Academic R&D Funding Increased 7% in FY 1983; Higher Gains Expected Through 1985	85-306
7% Real Growth Expected in 1985 National R&D Expenditures: Defense and Economy Major Factors	85-304
Defense Research and Development Emphasized in 1985 Budget	84-333
Plans for Company-Funded Research and Development Show 12% Annual Increases Through 1985	84-329
1983 Plant Biology Research Expenditures Totaled \$200 Million and Were Concentrated in Land-grant Institutions	84-327

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Graduate S/E Enrollment Rose 4% in 1983, with Major Gains in Computer Science and Engineering	85-313
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Ph. D. Scientists and Engineers Shift to Industrial Employment and Related Activities	85-301
Women and Non-U.S. Citizens Responsible for Increase in Production of Science and Engineering Doctorates in 1983	84-328
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